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II

E7.6-10240
CR-146523

THE UNIVERSITY OF UTAH

ERTS?
Prim. Investigator

COLLEGE OF MINES
AND MINERAL INDUSTRIES

DEPARTMENT OF GEOLOGY
AND GEOPHYSICS
717 MINERAL SCIENCE BUILDING

February 11, 1976

TO: Mr. James Broderick
Technical Officer, Code 902
NASA
Goddard Space Flight Center
Greenbelt Road
Greenbelt, Maryland 20771

N76-20588

Unclas
00240

FROM: M.P. Nackowski
Geophysics and Geology Department
College of Mines
University of Utah
Salt Lake City, Utah 84112

G3/43

SUBJECT Quarterly Report III, Period
October, November, December 1975

RE: Contract No. Mas5-20955
nt

(E76-10240) REMOTE SENSING IN MINERAL
EXPLORATION FROM LANDSAT IMAGERY Quarterly
Report, Oct. - Dec. 1975 (Utah Univ.) 8 p
HC \$3.50 CSCI 086

22840

RECEIVED

FEB 16 1976

SIS/902.6

TITLE: REMOTE SENSING IN MINERAL EXPLORATION FROM LANDSAT IMAGERY

A. PROBLEMS

We have experienced no unexpected problems which have significantly impeded the progress of this investigation. However, the 15 month time schedule for completion of the Contract project cannot be met. An extension of time through December 1976 has been requested. Additionally, it is recognized that additional financial support is required to complete the project. The time extension and additional funding are presented under recommendations.

As noted in the first quarterly report, our contract time framework both at the University of Utah and the Colorado School of Mines is out of phase with the cordilleran and intermountain field season. We believe that the needed studies can be completed during the 1976 summer field season. This field work could not be undertaken during the 1975 summer field season because preliminary work occupied the entire summer.

The budget limit in our EDC standing order account was reached during this quarter; however, we are satisfied that the LANDSAT imagery we have received to date will provide an adequate data base for our purposes.

B. ACCOMPLISHMENTS

I. A statistical analysis of linear stream segments within the Bottle Mountain, Nevada area has been completed. The stream lengths and azimuths within mineralized areas including the Battle Mountain district were compared with similar data from nearby unmineralized areas to establish whether differences could be recognized. The analysis suggests that differences may exist. The Park City, Tintic and the Yerington districts will be studied in a similar manner to further test this hypothesis.

II. The spatial relationship between mining districts and exposures of intrusive rocks in Nevada was analyzed statistically. Based on the preliminary null hypotheses proposed, no significant relationship was recognized. However, the spatial relationship between mining districts and exposures of intrusive rocks will be investigated further.

Although not all exposures of intrusives are spatially related to mining districts, most mining districts are in close spatial proximity to intrusives. In the Utah Nevada test site a study is in progress to categorize those parameters recognizable on the Landsat imagery which will enable an operator to consistently identify areas of intrusive igneous outcrops.

The goal of this study will be to assist regional mineral reconnaissance efforts by preliminary identification of areas of intrusive outcrops.

III. An imagery study of the Park City, Utah mining district is in progress in an attempt to relate surface fracture systems to subsurface productive mineralized vein systems. The goal is to provide if possible a guide to mine and mining district development and exploration by comparing and relating surface trends of mineralized or mineral related fractures with fractures and fracture patterns detected on LANDSAT and other imagery.

C. SIGNIFICANT RESULTS

The preliminary statistical analysis of length and azimuth of linear stream segments in the Battle Mountain area suggests that segment length (discriminating criterion) can be used to distinguish mineralized from non-mineralized areas.

D. PUBLICATIONS

none

E. RECOMMENDATIONS

It is urgently requested that an extension of time through December 1976 be allowed so that the contracted work can be completed. Additional funding will also be required to cover the extended period. The time extension and additional funding have been discussed with the Colorado School of Mines. Discussions and negotiations have been conducted by telephone with Mr. James Broderick.

Following is a summary budget of additional funding required by the University of Utah and by the Colorado School of Mines for the extended period through December 1976. The additional funding requested and negotiated total \$42,057.00

F. FUNDS EXPENDED

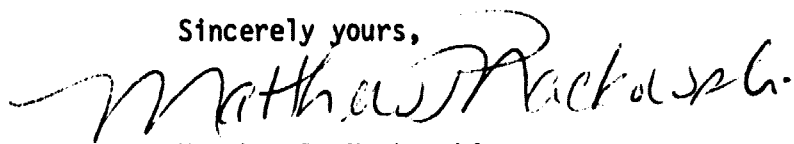
Total expenditures to 12/31/75	\$58,828.44
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G. DATA USE

Value of data allowed	\$ 9,300.00
Value of data ordered to 12/31/75	7,514.00*
Value of data received 12/31/75	6,042.00*

This third quarterly report for the period October, November and December 1976 is respectfully submitted. Attached is the supplemental budget requested for the time extension through December 1976. Also attached are two quarterly reports from the Colorado School of Mines submitted to me.

Sincerely yours,



Matthew P. Nackowski

attachments

Budget Sheet (3)

Colorado School of Mines Correspondence

Supplemental Budget for extension of Contract through December, 1976

University of Utah

Salaries - Principal Investigators

M.P. Nackowski and Lawrence Lattman

1/2 time for 2 months during summer 1976
and 5% time during academic year-months
October, November, December 1976

\$7,849

Stipends

Graduate Student stipends for
3 stipends at full time for 4 summer months
June, July, August, September, 1976 and 1/2
time during academic year months, October,
November, December, 1976

9,900

Employee Benefits

1,605

Indirect costs

6,133

Total

26,087

COLORADO SCHOOL OF MINES

Salaries

Senior personnel Robert Carpenter and David Trexler

a total of 3 months full time during summer 1976

4,000

Stipends

graduate Research Assistants at 1/2
time during academic year September,
October, November, December 1976

3,000

Field expenses

Computer

2,400

2,000

Employee Benefits

520

Indirect Costs

3,550

Report preparation

500

Total

15,970

Grand Total

42,057

Total Contract

154,057

Includes \$12,000 U.U. funds for equipment

Colorado School of Mines

golden, colorado 80401 • (303) 279-3381



geology department

January 23, 1976

Dr. M.P. Nackowski
Department of Geology and Geophysics
717 Mineral Science Building
University of Utah
Salt Lake City, Utah 84112

re: Contract No: NAS 5-20955

subject: Quarterly Report (1)
June - September

A. Problems

We were not informed that the Colorado School of Mines subcontract under NAS 5-20955 had been granted until July 1, 1975, and a signed contract was not received by our Office of Research Services until July 18, 1975. Dr. Trexler completed a microscopic examination of positive transparencies of LANDSAT-1 imagery on file at the Colorado School of Mines. About five hundred linear features of possible geologic significance were recognized and plotted on a 1:500,000 base map.

Dr. Carpenter because of overseas commitments could not join the program until September 1st. Soon thereafter two half time student assistants were engaged.

B. Accomplishments

A comprehensive bibliography of the geology of the Colorado Mineral Belt is well under way.

C. Significant Results

none

D. Publications

none

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Dr. M.P. Nackowski
Salt Lake City, Utah
January 26, 1976

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E. Recommendations

Because of inaccessability of the Colorado Mineral Belt during the late fall, winter and spring months an extension of time will be required; additional funding also will be needed to complete the subcontract work under the goals and objectives set forth under the program. Specific recommendations will be submitted to Dr. Nackowski after a meeting with him.

F. Funds Expended

To September 30, 1975, \$2,551.

Sincerely,

A handwritten signature in cursive script, reading "Robert H. Carpenter".

Robert H. Carpenter
Professo of Geology

RHC:ks

Colorado School of Mines

golden, colorado 80401 • (303) 279-3381



geology department

January 23, 1976

Dr. M.P. Nackowski
Department of Geology and Geophysics
717 Mineral Science Building
University of Utah
Salt Lake City, Utah 84112

re: Contract No. NAS 5-20955

subject: Quarterly Report (2)

A. Problems

Dr. Trexler and I have reviewed the budget of the Colorado School of Mines subcontract No. _____ and recommend an increase of \$9,900 broken down as follows:

Senior staff	\$4,000
Assistants	3,000
Field expenses	2,400
Report expense	500

It will not be possible to complete the work designated under the subcontract without this increase.

Also we estimate it will take until December 31, 1976 to complete these studies and finalize the report.

B. Accomplishments

A complete bibliography of the mineral deposits and mineral districts occurring within the Colorado Mineral Belt has been completed and is now being cross referenced.

A strip map of the Colorado Mineral Belt is being prepared on which the igneous intrusives, volcanics, major faults and centers of mineralization will be shown at a scale of 1:250,000. Local maps of selected areas also will be prepared at larger scale.

Dr. M.P. Nackowski
Salt Lake City, Utah
January 23, 1976

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C. Significant Results

Data gathering and cataloguing are up to date. Map preparation is progressing satisfactorily.

D. Publications

None to date.

E. Recommendations

Because of the late date of the subcontract execution no field work has been possible to date. An extension of time is requested until December 31, 1976. A budget increase of \$9,900 is recommended as funds essential to complete the work under the subcontract.

F. Funds Expended

To December 31, 1975, \$6,369.

Sincerely,



Robert H. Carpenter
Professor of Geology

RHC:ks